sents the average temperature of his own body at the different hours of the day, in order that he might eliminate this factor as a disturbing cause in his special observations. The curve represents an elevation of the temperature between the hours of 3 and 9 A.M., and a fall between 9 P.M. and 2 A.M., with an elevated temperature during the day, the undulations of which are far from constant and are difficult to characterise. In employing these results practically, Dr. Forel has introduced a method of turning them to account, which is as useful as it is precise and ingenious. In any special experiment, calling t the temperature, and T the normal temperature at the time of observation as found from the tabulated curve, then

$$t - T = t'$$

t' being the difference between the observed temperature and that which, under ordinary circumstances, it would be, either above or below it. As examples, we will take two given by the author:—

At 12 o'clock, noon, $T = 99{\cdot}09°$ F. On one particular occasion t was found to be 99·5° F., and therefore

$$t - T = t' = + 0{\cdot}41° \text{ F.}$$

On a second occasion, at the same time of day, the temperature observed was 98·78° F., from which it is evident that

$$t' = - 0{\cdot}31.$$

By the employment of this very simple means, therefore, the complications dependent on the time of day at which an observation is made may be immediately eliminated; all comparisons being between the different values of t', and not of t. Whether the assumption that the daily curve of body-temperature-change depends on the time of the day at which the observation is made, and on the time only, is a question into which the author does not enter, notwithstanding that such is the case has been by no means proved.

Turning now to the results arrived at from the investigation, the position in which the subject was left by Marcet and Lortet may be thus summarised:—

1. The temperature of the body, as a rule, falls during the act of ascending an incline.

2. During the time of the "mountain sickness," which so frequently accompanies the ascent of lofty heights, the body-temperature falls in a very marked manner.

Dr. Forel's earlier experiments, conducted in 1871, in which the thermometer was retained in the mouth, as was done by Marcet and Lortet, being directly opposite in their tendency, led him to commence the whole subject in 1872, as he remarks *ab ovo*, under his improved conditions.

As to the effect of an uncomplicated ascent, two instances are given in full, in both of which a considerable *rise* in temperature accompanied a rapid ascent of about an hour's duration. In one of these, at the end of the journey, the thermometer registered 102·5° F., whereas it was slightly below 100° F. on starting.

In a second series, three illustrations are given of the effect of well-marked fatigue, just short of exhaustion. The following are the deductions drawn from them:—

1. Even in conditions of great fatigue, the human body rises in temperature upon the muscular effort of ascending a height.

2. It is impossible for the author to determine if the elevation of animal heat due to the movement of ascension diminishes in proportion to the increase of the muscular fatigue.

Next as to the influence of an empty stomach on the temperature curve; and it must be noted, with regard to this point, that both Marcet and Lortet have stated that the fall in temperature accompanying an ascent is more marked during a fast than shortly after a meal. On himself, Dr. Forel, however, again proves that a fast of twelve or even twenty-four hours is no obstacle whatever to the rise of temperature which attends the muscular effort of ascending a hill.

By collecting and comparing the temperature-curves produced in ascending and descending inclines, the author is enabled to verify the theoretical necessity that the body-temperature is raised more by a descent than by an ascent. From twenty-one experiments, the average rise in temperature attending the act of ascending is found to be 2·412° F., whereas the mean of seven descents is found to be 2·772° F. The difference, 0·36° F., is small, it is true. If this fact is reliable, we find that a certain amount of heat is transformed into mechanical work during the act of ascent, a certain quantity being returned to the organism from without, under the opposite condition.

There are several minor points which Dr. Forel discusses in a particularly instructive manner, amongst which are the time of cooling after muscular exertion, the effect on the pulse and respiration of mountain climbing, and the cause of mountain sickness. He terminates his very interesting observations by the account of an ascent of Mont Rosa in July 1873 (15,217 feet), in which, notwithstanding that he suffered from mountain sickness, the body-temperature never showed any tendency to fall throughout, and was 101·5° F. on his reaching the highest point.

From this summary of Dr. Forel's results, when taken in connection with those of Dr. Allbutt,* it is evident that the temperature-fall observed by Drs. Marcet and Lortet during mountain climbing requires re-verification, and cannot be accepted as a physiological fact until a fallacy has been shown to exist in the method of investigation adopted by the Swiss experimenter.

A. H. G.

NOTES

At Cairo, on the 2nd inst., the inaugural meeting took place of the Société Khédivale de Geographie, under the presidency of the eminent traveller Dr. Schweinfurth and the patronage of H.H. the Khedive, who has shown special favour to the young society, having placed at its disposal a handsome suite of apartments furnished in suitable style, and also presented a valuable library, besides subscribing 400*l.* a year to the funds. This cannot but be gratifying to the friends of science and progress, and is a hopeful sign for the future of Egypt and of the extensive region from which it claims allegiance. Let us hope that like results will follow the intercourse between this country and the Sovereign of Zanzibar. With these two African potentates on the side of progress, the advantages to knowledge, as well as to Africa, could not but be great. At all events, under the powerful patronage of the Khedive, this Egyptian Geographical Society is bound to make valuable contributions to our knowledge of North Africa. Dr. Schweinfurth, in his inaugural address, which was characterised by great fervour, spoke of the domain and progress of geography. "It has become," he said, "an immense domain, the meeting-place of all branches of human science. The geography of the present does not aim at merely describing the external form of the earth, the vesture which it has assumed; it seeks to show the chain of hidden causes of which this form is the expression." He then spoke of Africa and the great interest attaching to it, and especially to the Nile, the sources of which he believes contain the key to all the mysteries of Africa. Dr. Schweinfurth then referred to the history of Egypt and its progress under its present ruler, by whose special desire the Society has been organised. The motto of the Society, he said, should be *Nusquam otiosus*, and its duty *Centraliser et encourager*. After pointing out to those who take a "utilitarian" view of science, that all the comforts and commodities of modern life are due to researches which, though purely theoretical in their origin, have yielded magnificent practical results, Dr. Schweinfurth indicated the benefits to be gained from the increase of geographical knowledge, and described the organisation of the new Society and the task which lies before it. He showed what advantages a Society so situated had over European societies for extending our knowledge of Africa, and pointed out what yet remained to be done ere the topography of North Africa could be considered anything like completely known. We notice that the principal geographical societies of Europe and America have sent their congratulations to Dr. Schweinfurth on the founding of this Society; England's name, however, is not mentioned.

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* *Journal of Anatomy and Physiology*, vol. xi. p. 106.

Mr. Macleay, who has organised the expedition to New Guinea, our readers may remember, has already liberally endowed Sydney University. The ship he has fitted out for exploring New Guinea is a 400-ton man-of-war. His chief object is to enrich his Natural History collection, and he intends to do deep-sea dredging; he takes also a steam launch for ascending the rivers. There is one immense river, named the "Fly" River, after H.M.S. *Fly*, about which nothing is known. Mr. Macleay thinks that he will be able to ascend some 200 miles.

M. Poljakow, commissioned by the Russian Geographical Society, undertook a journey last year into the region of the Upper Volga, chiefly for zoological purposes, though he also obtained some important geologico-geographical results, an account of which appears in Heft vi. of Petermann's *Mittheilungen*. From the observations which he made, Poljakow concludes that the Scandinavian Finlandic glacier which once held in its fetters the government of Olonez and the neighbouring governments, must have stretched far into the basin of the Volga and over the boundaries of the Waldai plateau; and that by the unequal levels of the lakes formed by the melting of the glacier, the slender remains of which are seen in the existing lakes, undoubtedly a connection existed between the basin of the Volga and the Arctic and Baltic seas. Judging from the fauna, Poljakow concludes that the present upper course of the Volga must have been joined to the middle and lower course at a recent period and in a manner accidentally. The upper river has an entirely different and indeed a more northern water fauna than the middle and lower river. In this respect is the Scheksna to be considered the natural upper part of the Volga, for it contains the very same fishes as that river as far as Bjelosero.

Dr. Forel, of Lausanne, has for several years been investigating what are known as the *Seiches* of the Lake of Geneva. *Seiche* is applied locally to certain oscillatory movements which are occasionally seen to occur on the surface of the lake. The phenomenon had been investigated by previous observers, among others by Saussure and Vaucher, who attributed the phenomenon to variations in atmospheric pressure; in this, Forel, who has most minutely investigated the phenomenon, agrees with them. The phenomenon is found to occur on other Swiss lakes, and Forel believes it will be found in all large bodies of water. Indeed, he recognises in the *Seiche* probably the most considerable and the grandest oscillatory movement which can be studied on the surface of the globe. His investigations have led him to the conclusion that the *Seiche* on the Swiss lakes is an oscillatory undulation (*ondulation de balancement*), having a true rhythm, and that the phenomenon is not occasional, but constant, though varying in degree. The duration of a *Seiche* is a function of the length and depth of the section of the lake along which it oscillates; this duration increases directly with the length and inversely with the depth of the lake. The instrument he has devised for the investigation of the phenomenon he calls a *plémyramètre* ("tide-measurer"). A detailed account of Forel's investigations will be found in two papers in the *Bull. de la Soc. vaud. des Sciences Naturelles*, tomes xii. and xiii. Both papers have been republished separately.

Heft vi. of Petermann's *Mittheilungen* contains a valuable paper by Vice-Admiral B. v. Wüllerstorf-Urbair on the Meteorological Observations made by the recent Austro-Hungarian Arctic Expedition, with an analysis of the ship's course. The paper is accompanied by a chart showing the drift of the ice, the course of the ship, the depths of soundings, the direction of the wind, and various other data.

At the meeting of the Geographical Society on Monday, a lecture was delivered by Admiral Sir Leopold M'Clintock on "Arctic Sledge Travelling." After an account of the expeditions of former Arctic travellers, from Parry downwards, Sir Leopold gave a description of the appliances required for Arctic travelling, and of the difficulties to be encountered. To sledging, he said, we are indebted for almost all our Arctic experiences, and to sledging we shall owe the principal share of whatever work may be done by the brave men now going out. The greatest bar to their progress would be ice too thin to sledge over; sledge-bearing ice or open water their equipments will enable them to traverse.

An opportunity will occur of sending letters for the Arctic ships *Alert* and *Discovery* by the exploring yacht *Pandora*, which will leave Portsmouth about the 23rd instant, Mr. Allen Young, commanding that vessel, having consented to receive letters, newspapers, &c., upon the chance of their being delivered to or deposited for those ships. No articles of value should be sent, and letters, &c., should be addressed to the General Post Office, and marked "Per exploring yacht *Pandora*."

A very full and interesting *résumé* of the progress of geographical discovery and of the sciences connected with geography, by M. Charles Maunoir, appears in the April number, just issued, of the *Bulletin* of the French Geographical Society; it is illustrated by a series of small maps. The same number contains the plan of a scientific journey into the interior of Indo-China, by Dr. J. Harmand.

New York telegrams of June 12 report a terrible earthquake in the Cucuta Valley, Republic of New Grenada. Cucuta, it is stated, has been entirely destroyed. Five other towns were nearly destroyed, and 16,000 persons are reported lost, out of a population of 35,000.

A telegram dated Barcelona, June 10, states that some shocks of earthquake had been felt there and in the neighbouring villages.

The U.S. Hydrographic Office, of which Commodore R. H. Wyman, U.S.N., is superintendent, has commenced the systematic establishment of secondary meridians by telegraphic exchange of time-signals. Lieut.-Commander F. M. Green, U.S.N., is at present in charge of the work, and has during the past winter made observations at Panama, Colon, Kingston, Santiago di Cuba, and Havana. The starting-point used for the determination of longitude has been the meridian of Key West, Florida, established with great care by the U.S. Coast Survey. In addition to longitude observations, the latitude of each station has been determined with the zenith telescope. The work will be continued next winter through the Windward Islands to Guiana and Brazil. The liberal conduct of the companies owning the cables has much facilitated the successful prosecution of the work.

We may see from the following extract from the New York *Nation* how very closely our doings on this side of the water are watched. The appointments referred to we have already announced in Nature, but the comments upon them by the *Nation* indicate what we hope will be the method pursued by England in the course of time, though we fear the course will be a very long one. "Two recent appointments," the *Nation* says, "in the University of Zürich seem to merit notice, as signs of the times. One is that of Prof. W. Wundt to the Chair of Philosophy, the other that of Prof. E. Hitzig to the Chair of Psychology. Wundt has long been occupied at Heidelberg, first as Assistant, then as 'Ordinary' Professor of Physiology, whilst Hitzig has been a medical practitioner and lecturer on electro-therapeutics in Berlin. So far as we know, the latter has written nothing on purely mental science. His discovery of the irritability of the surface of the brain is his chief title to fame; all that he has written shows erudition, great experimental thoroughness, and conscientiousness in drawing inferences. Wundt is one of the most learned of German investigators. His own special work has lain most in the line of the senses and the nervous system, the territory common to mind and matter; and all the elements of his training hitherto unite to make him an eminently well-qualified teacher of mental science. Indeed, we doubt not that his long apprenticeship in physiology was accepted by him merely that he might be the better educated for philosophy. In this country such appointments would probably provoke a good deal of orthodox alarm. But in Germany not only is thought more fearless of consequences, but 'camps' in opinion are much less clearly defined, and materialistic and spiritualistic tendencies keep house together most amicably in the same professional brains. We cannot help regarding such appointments as these as hopeful tokens of a new era in philosophical studies—an era in which the old jealousy between the subjective and the objective methods shall have disappeared, and in which it shall be admitted that the only hope of reaching *general* truths that all may accept is through the co-operation of all in the minute investigation of special mental processes. We may then see solid philosophical conclusions gradually emerging from the mass of discoveries of detail, just as happens in the sciences more especially recognised as 'inductive.'"

We take the following from the *Athenæum*:—Mr. William Davis, who has been an attendant at the British Museum since 1843, but has practically fulfilled, for a long time past, duties requiring considerable scientific acquirements for a salary which, after the lapse of thirty years, had risen to the magnificent sum of some twenty-five shillings a week, was on Wednesday appointed by the Trustees an assistant in the Department of Geology. Mr. Davis was the first recipient of the Murchison Medal of the Geological Society, and is a well-known authority upon vertebrate fossils, especially fishes and mammalia.

The series of papers on Portuguese Travel by Mr. John Latouche, which have appeared in the *New Quarterly Magazine*, are shortly to be published by Messrs. Ward, Lock, and Tyler, under the title of "Travels in Portugal," with illustrations by the Right Hon. T. Sotheron-Estcourt.

A telegram, dated "Strangway Springs, April 17," has been received from Mr. Ernest Giles, who has been exploring to the north of Fowler's Bay, Australia. He had had one long stretch of 220 miles without water; all the horses died, and he was only saved by his two camels. Mr. Lewis's expedition to Lake Hope, South Australia, has proved successful. Lake Hope he found perfectly dry. Before completing his work, Mr. Lewis purposes endeavouring to discover a route between the south-west portion of Queensland and the north-west of New South Wales, with a view of establishing direct overland communication with the former colony.

The annual meeting of the Palestine Exploration Fund was held last Thursday. Since the Society was founded in 1865, four expeditions have been made, and surveys and excavations effected. The surveys have extended from Mount Carmel in the north to Beersheba in the south, and from Askelon in the west to the Dead Sea.

The death of the lamented Rémusat has created a majority in favour of M. Dumas in the election which will take place at the Académie Française five months hence. It was owing to the prospect of a vacancy that the election was postponed when the Academicians were unable to agree after three successive meetings.

The death is announced, on June 9, at the age of seventy-nine years, of M. Deshayes, Professor in the Paris Musum of Natural History.

La Revue Scientifique records the death, on May 11, at the age of thirty-two years, at Algiers, of a distinguished Mussulman chemist, Abdallah ben Mohammed. His mission was to instruct in the physical sciences, and especially in chemistry, the native Algerians; for this purpose he had to devise an Arabic terminology.

The death is announced of Senhor Joaquim Henriques Fradesso da Silveira, director of the Meteorological Observatory of the Infanta Don Louis at Lisbon.

The Professorship of Chemistry at Munich, we learn from the *British Medical Journal*, which has remained vacant since the death of Liebig, has been accepted by Prof. Baeyer of Strasburg, who will commence his duties next winter session.

The jury of the Exhibition of the French Central Society of Horticulture has awarded a large gold medal to M. De la Bastie for his discovery of hardened glass, on account of the services it is likely to render to horticulture.

The Annual Report of the United States Geological and Geographical Survey, describing the explorations of the year 1873, which has just reached us, contains, besides the descriptive letter-press, several valuable illustrations of some of the more recently discovered genera and species of Mammalia belonging to genera closely allied to Dinoceras (Marsh). These include *Symborodon bucco* (Cope), *S. Saltirostris*, and *S. ater*, all very peculiar forms.

We have received the third Annual Report of the Zoological Society of Philadelphia, just published, which tells very strongly in favour of the institution. The additions by presentation and purchase are numerous, including six Giraffes, an Elk, an African and an Indian Elephant, and a Ka-Ka Parrot. We may judge that the Gardens are constantly kept in view by the citizens in their travels, from the fact that not less than twenty-three alligators were presented within three months.

The President of the Italian Geographical Society has received favourable intelligence of the expedition sent to examine the possibility of conducting the waters of the sea into the hollow basins of the Sahara. The expedition will be divided into two parties at Gares. One is to explore the Oasis of Gerid, and carry out some interesting collateral researches among the ruins of Carthage, particularly the remains of the aqueducts and the remarkable lead mountain of Gebel Drucas.

An attempt which has just been made to introduce living humming-birds into the Paris Jardin d'Acclimatation has failed, although a traveller managed to bring six alive to Paris by feeding them with honey. The only other humming-birds which have reached Europe alive were those brought by M. Delattre in 1855 from Central America, but these died a fortnight after their arrival in Paris.

"Nuragghi Sardi, and other Non-historic Stone Structures of the Mediterranean Basin," is the title of an illustrated pamphlet by Capt. S. P. Oliver, who offers it "as a slight contribution towards the constantly increasing knowledge of those pre-historic remains which are scattered in mysterious groups throughout the Old World." Carson Brothers, of Dublin, are the publishers.

THE additions to the Zoological Society's Gardens during the past week include a Grant's Gazelle (*Gazella granti*) from East Africa, presented by Dr. Kirk; a Beccari's Cassowary (*Casuarius beccarii*) from New Guinea, presented by Sir James Fergusson; an Owen's Apteryx (*Apteryx oweni*), two Weka Rails (*Ocydromus australis*), a Black Wood Hen (*Ocydromus fuscus*), from New Zealand, presented by Dr. G. Hector; two Australian Cranes (*Grus australasiana*) from Australia, presented by the Acclimatisation Society of Wellington, New Zealand; a Brown Indian Antelope (*Tetraceros subquadricornutus*) from India, a Dufresne's Amazon (*Chrysotis dufresniana*) from South-east Brazil, four Vulturine Guinea Fowls (*Numida vulturina*) from East Africa, an Anaconda (*Eunectes murinus*) from South America, purchased.

RECENT PROGRESS IN OUR KNOWLEDGE OF THE CILIATE INFUSORIA[*]

I BELIEVE that the object contemplated by the addresses which it has been the custom of your Presidents to deliver year after year to the Fellows of the Linnean Society will be best fulfilled by making them as much as possible the exponent of recent progress in biological science. The admirable addresses with which my distinguished predecessor has during his long tenure of office so greatly enriched our journal, afford an example as regards the exposition of botanical research which may well be followed in biology generally. The field, however, which thus offers itself is so wide, the activity in almost every department so intense, that the necessity of restricting the exposition within a limited area becomes imperative if it be expected to produce anything like a definite picture instead of a vast assemblage of images confused and ill-defined by their very multiplicity and by the condensation which would be inseparable from their treatment.

While thus imposing on myself these necessary limits, it is almost at random that I have chosen for this year's address some account of the progress which has recently been made in our knowledge of the CILIATE INFUSORIA—a group of organisms whose very low position in the animal kingdom in no way lessens their interest for the philosophic biologist, or their significance in relation to general morphological laws.

To enable you to form a correct estimate of the value of recent researches, it may be well to bring before you in the first place, as shortly as possible, the chief steps which have led up to the present stand-point of our knowledge of these organisms.

It is scarcely necessary to remind you that the first important advance which during the present century was made in our knowledge of the Infusoria dates from the publication of the great work of Ehrenberg,[*] whose unrivalled industry opened up a new field of research when, by his expressive figures and well-constructed diagnoses, he made us acquainted with the external forms of whole hosts of microscopic organisms of which we had been hitherto entirely ignorant, or which were known only by such figures and descriptions as the earlier observers with their very imperfect microscopes were able to give us.

Ehrenberg, however, as we all know, did not content himself with pourtraying the external forms of the microscopic organisms to whose study he had devoted himself, but sought also to determine their internal structure, of which scarcely anything had been hitherto known. In this direction, no less than in the other, the perseverance of the celebrated microscopist never flagged; but, unfortunately, at the very commencement of his researches he slid into a misleading path, and was never again able to find the right one.

Everyone knows how Ehrenberg, in accordance with preconceived notions of the high organisation of *all* animals, attributed to the Infusoria a complicated structure; how, while he rightly distinguished them from the Rotiferæ with which they had been confounded by previous observers, he yet regarded them as intimately related to these representatives of a totally different type; and how, in attributing to them a complete alimentary canal with numerous gastric offsets, he took this feature as their most important character, and designated them by the name of *Polygastrica*. And it is probably a matter of surprise to many of us, that with the overwhelming mass of evidence which subsequent research has brought to bear against the truth of the polygastric theory, the great Prussian observer should still adhere with undiminished tenacity to his original views.

Among the authors who, since the publication of the "Infusionsthierchen" have contributed most to a correct estimate of the morphology, physiology, and systematic position of the Infusoria, the names of Von Siebold, Stein, Balbiani, Claparede, and Lachmann, and most recently, Haeckel, stand out conspicuous.

The first who from a strong position offered battle to the authority of Ehrenberg was Carl Theodor von Siebold.[*] Von Siebold rejected *in toto* the polygastric theory, and, so far from admitting a complexity in the organisation of the Infusoria, he regarded them as realising the conception of almost the very simplest form of life, and attributed to them the morphological value of a cell.

Let us see what is involved in this most significant comparison. The essential conception of a cell is, as you know, that of a more or less spherical mass of protoplasm with or without an external bounding membrane, and with an internal nucleus or differentiated and more or less condensed portion of the protoplasm. It was to a form of this kind that Siebold compared the body of an Infusorium. He called attention to the soft protoplasmic mass of which the body mainly consists; to the external firmer layer by which this is surrounded; and to the variously-shaped body differentiated in the protoplasm, to which Ehrenberg had gratuitously attributed the function of a male generative organ. Here then were, according to Siebold, the protoplasm body substance, the bounding membrane, and the nucleus of a true cell.

The morphological value thus attributed to the true Infusoria —under which were included the Flagellatæ—was extended by Siebold to Amœba and its allies, and to the whole assemblage so constituted he assigned the position of a primary group of the animal kingdom to which he gave the name of PROTOZOA, whose essential character was thus that of being unicellular animals. He then divided his Protozoa into those which had the faculty of emitting pseudopodial prolongations of their protoplasm (Amœba, &c.), and those in which the place of the pseudopodia was taken by vibratile cilia or by lash-like appendages. To the former he gave the name of *Rhizopoda*; to the latter he restricted that of *Infusoria*; and lastly he divided the Infusoria into the mouth-bearing, *Stomatoda* (Ciliata), and the mouthless, *Astomata* (Flagellata). From every point of view Von Siebold's conception of the morphology of the Protozoa, and his sketch of their classification, however much this may have been subsequently modified, must be regarded as marking out an epoch in the history of zoology.

Shortly after this the unicellular theory was strongly supported by Kölliker,[†] and received further confirmation from the researches of Stein,[‡] who, however, was unable to accept it to its full extent. With an industry almost equal to that of Ehrenberg, Stein had the advantage of the more philosophic views of organisation which had emanated from the newer schools of biology, and to him we are indebted not only for more accurate views of the structure of the Infusoria, but for the first important contributions to our knowledge of their development; and though the opinion which he at one time entertained, that the true Acinetæ are only stages in the development of the higher Infusoria, has been abandoned by him, he has nevertheless demonstrated the presence in an early period of the development of certain species, of peculiar pseudopodial processes resembling the characteristic capitate appendages of the Acinetæ, an observation of importance in its bearing on the relations of these last to the true Infusoria. No doubt can remain, after Stein's observations, that the Infusoria in their young state have the morphological value of a simple cell, and it is only after their development has become advanced, and that a marked differentiation has begun to manifest itself in this primordial condition, that there can be any difficulty in accepting their absolute unicellularity.

About this time Balbiani drew attention to some very important phenomena in the life history of the Infusoria.[§] It had been known even to the early observers that the Infusoria multiplied themselves by a process of spontaneous fission. They had been frequently observed in the act of transverse cleavage, and had also been noticed in what appeared to be a similar cleavage taking place in a longitudinal instead of a transverse direction. Balbiani, however, showed that this apparent longitudinal

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[*] Anniversary Address to the Linnean Society, by the President, Dr. G. J. Allman, F.R.S., May 24.

[†] "Die Infusionsthierchen als vollkommene Organismen." Leipzig, 1838.

[*] Siebold, "Lehrbuch der vergleichenden Anatomie," 1845.

[†] Zeitschr. f. Wissens. Zool., 1849.

[‡] Stein, "Der Organismus der Infusionsthiere," 1867.

[§] Balbiani, "Recherches sur les organes générateurs et la reproduction des Infusoires." *Comptes Rendus*, 1858, p. 383.